

## PRELIMINARY ANALYSIS OF AVIATION SAFETY ACTION PROGRAMS IN AVIATION MAINTENANCE

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The objective of the Federal Aviation Administration's (FAA) Aviation Safety Action Program (ASAP) is to encourage air carrier and repair station employees to voluntarily report errors that may be critical to identifying potential precursors to accidents. Under an ASAP, safety issues are resolved through corrective action rather than through punishment or discipline. The ASAP provides for the collection, analysis, and retention of obtained safety data. The goal of this study was to conduct a preliminary analysis of the ASAP program in order to identify specific factors that may contribute toward a successful or unsuccessful ASAP program. Structured focus group discussions were conducted at six partner companies. The results of these discussions indicate that the broad issues include employee-management-FAA trust, labor-management relationship, level of knowledge about ASAP program/process, and workload involved in management of an ASAP program.

### Introduction

In 1996, Aviation Safety Action Programs (ASAPs) were introduced in the flight domain with the hope of encouraging pilots to disclose their errors, and more importantly the factors contributing to their errors. With this knowledge, systemic solutions could then be implemented (Harper & Helmreich, 2003) to preclude recurrence. In the absence of specific disclosure by pilots, vital information is not available to the air carrier or the Federal Aviation Administration (FAA) and the solutions are not likely to be systemic. In order to encourage pilots to participate in such a program, the FAA developed specific guidance (AC 120-66) for all the parties involved: FAA field inspectors, pilots unions, and air carrier management. As delineated in this guidance material, the FAA was genuinely interested in obtaining safety-related information through a non-punitive program. Since its initial introduction, twenty-eight air carriers have entered into an ASAP agreement, and they are estimated to file between 3 and 12 ASAP reports per day (Harper & Helmreich, 2003). Generally, these air carriers are very satisfied with their programs and they believe that the program has identified systemic discrepancies that would not have been otherwise discovered.

In an effort to expand the scope of the ASAP programs, the FAA added guidance materials for the maintenance community (AC 120-66A and -66B). In spite of this maintenance-specific guidance, only six maintenance organizations have developed an ASAP agreement. Both the FAA and the maintenance organizations want to minimize maintenance errors. In this paper, we present the preliminary analysis of success factors and failure factors associated with ASAP programs among aviation maintenance organizations.

### Literature Review

Since the Aloha Airlines accident in 1988, the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA) have sponsored several research projects in the area of maintenance safety. All the reports resulting from the FAA-funded research projects are available through the FAA's websites (see <http://hfskyway.faa.gov> and [http://www.hf.faa.gov/maint\\_docs.htm](http://www.hf.faa.gov/maint_docs.htm)). Considering that the current research proposal seeks to determine the success/failure factors in Maintenance Aviation Safety Action Programs, the review of literature will focus on the general status and scope of the Maintenance ASAPs and studies pertaining to self-reporting of errors.

#### Status and Scope of Maintenance ASAPs

Early interest in proactive non-punitive measures is evident in the Maintenance Resource Management Roundtables conducted at US Airways (Taylor & Christensen, 1998). An MRM Roundtable, as it was called, consisted of a representative from the company, a representative from the International Association of Machinists and Aerospace Workers, the FAA Principal Maintenance/Avionics Inspector, and the mechanic(s) who committed the error. A memorandum of understanding (MOU) was signed between the company and the FAA that would establish that the intent of a roundtable discussion was to collect safety-critical information that would not have come forward without direct and honest participation by the person who committed the error. The tripartite team (FAA, company, and labor union) endeavored to steer clear of the prevalent blame culture (c.f. Marx and Graeber, 1994) and seek a better understanding of the causal factors leading to the error. By adopting this approach, the team was successful in winning the labor force's trust and truly implementing comprehensive and systemic solutions. In response to such a program,

several key issues were resolved without resulting in an FAA enforcement action against the mechanic or the company. Unfortunately, the roundtable system was practiced at only one company and was difficult to duplicate at other companies because other people (including FAA inspectors and company managers) were not as amenable to such a system. (Taylor & Christensen, 1998).

Mechanics who did not have access to a roundtable discussion, had two other options: they could either submit a report to NASA's Aviation Safety Reporting System (ASRS) or use the guidance provided in Advisory Circular 00-58 (c.f. FAA, 1998) to file a voluntary self-disclosure report. The ASRS report may provide limited protection to the individual reporter, but the reporter's complaint cannot be acted upon by the company management or the FAA because the individual reports are de-identified; however, NASA will provide statistical information to the FAA if a significant number of reports identify the same problem. A self-disclosure report filed in accordance with AC 00-58, on the other hand, will provide additional legal protection and bring the reporter's concern directly to the company management and the FAA. This advisory circular is designed for a generic (not limited to maintenance) reporting of regulatory violations by all individuals as well as organizations. In practice, organizations use this protocol more frequently than individuals. Therefore, this approach is perceived by the industry as primarily an organization-level disclosure rather than individual-level disclosure. The current ASAP program is focused on the individual making the self-disclosure, providing specific legal protection to the reporter as well as supporting a collaborative relationship between the FAA and the Company.

Philosophically, there seemed to be an agreement between the FAA and the maintenance community that the mechanic who actually commits the error holds key information that was essential to the development of a true comprehensive solution. Such agreement is supported by extensive research in the area of error causation (Battles, Kaplan, Van der Schaff, & Shea, 1998; Gambino & Mallon, 1999; Van der Schaff, 1991 cited by Harper & Helmreich, 2003). The erring mechanic has no incentive (other than ethical obligation) to disclose his/her error unless there was an effective non-punitive process in place. Therefore, the FAA issued guidance materials to develop Maintenance ASAP agreements (The pilot community had already established an ASAP program---in 1996). The purpose of a Maintenance ASAP agreement is to provide a non-punitive forum for mechanics to come forward and disclose their errors to the FAA and the air carrier so

that systemic solutions could be implemented and similar errors, due to similar causes, could be minimized. Since the advisory circular pertaining to Maintenance ASAPs used language similar to the flight domain and was difficult to apply in the maintenance domain, there was some difficulty in securing Maintenance ASAP agreements. As of December 2003, there are six companies with successful Maintenance ASAP agreements (c.f. FAA 2003).

#### Self-reporting of Errors

It is evident from the exponential rise in the number of ASRS reports filed by mechanics since 1996 that mechanics are willing to report their errors (Patankar & Taylor, 2001). In an analysis of errors resulting in regulatory violations, Patankar (2002) discovered that the majority of the violations were in the area of the recommended standard practices and procedures for aircraft mechanics (Title 14 of the Code of Federal Regulation, CFR, § 43.13); whereas, rest of the violations tend to be pertaining to maintenance manuals and maintenance/inspection processes (14CFR § 121.369). Assuming that the ASRS reports provide protection against punitive actions by the FAA in the case of unintentional regulatory violations, it is reasonable to infer that mechanics are likely to file an ASRS report if they think that they may have violated a regulatory requirement or if they think that their employer is violating a regulatory requirement. Given that the ASAP agreement does not protect individuals or companies against rule violations, the motivating factors for individuals as well as companies will have to be studied further.

#### Reporting Behavior in Maintenance

In a recent study of reporting behaviors among 178 maintenance personnel in Australia, Fogarty (2003) reported that organizational factors/culture had a strong influence on the individuals' willingness to report maintenance errors. Fogarty concluded "employees were more likely to report mistakes in situations where management is communicative, open, and committed to safety values." In a similar study, Harper and Helmreich (2003), listed the following as factors that may influence an individual's willingness to report their own error: (a) mandatory versus voluntary system, (b) reporter protection, (c) ability to affect change, (d) fear of litigation and disciplinary action, (e) attitude toward the use of current reporting systems, (f) ease of use of the new/proposed system, (g) personal responsibility to address changes, and (i) management's endorsement of the new/proposed reporting system.

## Methodology

Structured focus group discussions were conducted at six organizations: three with maintenance ASAP programs and three without. A list of ten questions was used to facilitate the discussion. The questions and their corresponding responses are presented in the results section.

## Results

A comprehensive list of responses to the focus group discussion questions is presented in this section. The list is not presented in a prioritized order. Also, frequency counts specifying the number of respondents bringing-up a particular issue are not reported because of small sample size. Again, the main goal of this study was to get a preliminary sense of the relevant issues.

The focus group discussion questions are presented in a numbered list below; responses to each question are presented as bullet points.

1. What's the first word/phrase that comes to mind when you hear "Maintenance ASAP"?
  - Safety
  - Time-commitment involved; labor intensive
  - Impressed by airline's commitment
  - Impressed by union's resources
  - ASAP used to be viewed as a "Get out of jail FREE card" but the new MOU has changed it a bit
  - Long time in coming.
  - Did not know, until several months ago, what ASAP was. Neither do our supervisors or mechanics. I questioned about 50-60 people about it.
  - Interesting company program.
  - Exposure
2. (A) What are some of the advantages of the ASAP program?
  - We now know about things that are happening that we otherwise would not know about.
  - FAA's closer working relationship with the Union and the Company.
  - Allows FAA to get changes made with Company and Union that would typically be much harder to get accomplished.
  - Cuts out a lot of the red tape in getting things accomplished without issuing Letters of Investigation (LOI's).
  - ASAP reports are tagged by flight number and date. If we get multiple reports for the identical flight and date, I am automatically alerted. If we can have maintenance reports as well, we will be

able to provide a more comprehensive investigation and more universally acceptable solutions. We can have a single repository for all ASAP data

(B) What are some of the hurdles in establishing such a program at your Company?

- A lot of trepidation in "giving up something", e.g., disciplinary action, enforcement action, etc.
- Manpower resource issue.
- Cost prohibitive for small carriers.
- Complex maintenance issues sometimes take 10-12 actual hours to investigate. If done on a part-time basis, they could take up to one week.
- FAA has final say-so in action taken under an ASAP program, regardless of the ERC decision.
- Lack of consistency within the industry in dealing with the CMO's [FAA's Certificate Management Office]. Drives us to Washington.
- Difficulty in attempting to get the employees to speak up.
- Local FAA concerned with their work scope change and a change in their enforcement power.

(C) If your Company has a Maintenance ASAP agreement, can you describe some success stories?

- More self-disclosures resulting from mechanics coming forward through ASAP.
- Issues at Company, e.g., tooling requirements, material requirements, etc. are being corrected. [Several specific examples were provided by the focus group participants].
- Inspection buy-backs were increased/enhanced. Fleet Campaigns were increased.

(D) If your Company does not have a Maintenance ASAP, have you tried to establish one? Why? Why not?

- Have not tried to establish one. The MEDA [Boeing's Maintenance Error Decision Aid, used to classify error types and contributing factors] process works. Concerned about FAA's involvement.
- We currently have in place a strictly internal program. We have not attempted to implement an ASAP Program. Both the FAA and Company felt that the extra manpower requirements required to implement the Program (4 employees) would be a constraint.
- We believe that employees would be more reluctant to submit reports knowing that the FAA would be involved vs. be addressed strictly in-house.
- Unable to get Union's acceptance
- Viewed by many as a scam by the company

3. What are your views regarding the security or confidentiality of the data submitted under the ASAP agreement?
  - Information needs to be shared with employees of “lessons learned.”
  - There have been no leaks that would compromise the program. Nobody can use ASAP information anyway.
  - The Union is concerned about who maintains the statistical data that is generated by ASAP investigations and how it is used. If there is limited access to the data, can it be manipulated?
  - Our company’s primary concern is the public getting hold of the information/data.
  - Our company is seriously concerned with security and confidentiality issues, since the FAA can remove an issue submitted under ASAP and place it in a punitive/ administrative action process if they deem that it does not meet the ASAP guidelines. The local FAA has strong, unilateral powers under the ASAP.
  - 100% success rate in maintaining confidentiality. People know about ASAP, but when other people ask our investigators why they are investigating certain issues, the members simply say that it is confidential.
  - The ERC [Event Review Committee: FAA, Union, and Management representatives] protects and maintains all data.
  - The people here don’t trust the local FAA because they are likely to repackage the raw data to suite their needs.
  - Company is concerned with the MEDA summaries going public—in the newspapers. That’s what’s holding-up the communication of MEDA results to the individuals.
  - Confidentiality is about individuals not about situations---data discovered through an ASAP reports may result in fleet-wide campaign directive or fleet grounding.
4. What are your views regarding the comprehensive changes implemented as a result of an ASAP agreement, whether in your Company or another?
  - Some ASAP reports have resulted in Ads [Airworthiness Directives]
  - Need to reassure employees that all ERC recommendations will be implemented.
  - Faster change process now. More authority due to the FAA’s active involvement
5. How do you compare/contrast the ASAP agreement with pilots to that with mechanics?
  - Flight ASAP agreement viewed as a “get out of jail free” card.
  - The Flight Department ASAP is processed through their ASAP Manager. We had a process flow chart that they initially used for consistency and documentation purposes, but now that they are familiar with the process they simply use it for guidance. The Flight and Dispatch Departments have had approximately 600 submittals. About 75% were submitted by e-mail, 15% by their website, and hard-copy submittals accounted for the final 10%. Maintenance MEDA submittals are processed through their Human Factors Manager.
  - The Maintenance Department does not have as ASAP agreement. However, under their MEDA reporting system they received about 270 events last year. Only six were non sole-source. In other words, 264 would not have been known about if it had not been for their MEDA submittal process. Their approach is no harm, no foul.
  - In the Flight Department, the ERC does not interview any of the submitters. They let ALPA [Air Line Pilots Association—a pilots’ union] perform this task. This process is described in their policies and procedures, and not in their MOU. In Maintenance, the Union and Company jointly interview the involved employee.
  - Flight ASAP gets 200-300 reports per week; whereas, maintenance ASAP gets that many a year. Yet, maintenance programs consume more investigative resources than flight.
  - In maintenance ASAP, there are three independent investigations of the same incident: FAA investigation, QA investigation, and Mechanic investigation
  - Most of the maintenance issues are deep latent: some items are over 2.5 years old and the mechanics have forgotten what happened.
  - Pilots and mechanics have very different ASAP programs—apples and oranges.
  - Pilot cases are typically open and shut; very little research time is involved. In maintenance, there are a lot of misunderstandings that need to be clarified through validation of data
6. Why do you think that a disproportionately large number of airlines have ASAP agreements for their pilots but not for their mechanics?
  - Pilots recognize problems instantly, mechanics do not.
  - 90% of pilots’ submittals are sole source. 90% of mechanics are not sole source.
  - If a pilot does something wrong, it is too late.
  - 90% of the pilot reports are sole-source reports

- 90% of the mechanic reports are not sole-source (within company) reports
  - No confidence by Maintenance employees in fairness by Management or the FAA.
  - ALPA is very organized and therefore able to stay ahead of the ball. They have very good resources, both legal and technical to provide prompt analysis and feedback.
  - On the pilot side, if something bad happens, there's usually no immediate corrective action. Attention is focused on minimizing the effect of that action or on minimizing the recurrence of that action. In maintenance, there is relatively more time to contemplate on the decision, but the mechanic may not know for years that he made a mistake.
7. Are there any regulatory changes that need to be implemented prior to a better acceptance/implementation of the ASAP agreements in maintenance?
- Confidentiality issues should be covered in the FARs.
  - Legal protection. The ASAP Committee could be working on an issue, and a mishap occurs related to the issue before final disposition has been determined. Liability?
  - Confidentiality issues should be with the involved parties, not with the issues.
  - Under the present Advisory Circular, the FAA has final call on action to be taken. This should be the joint responsibility of the ERC.
  - How is maintenance outsourcing controlled, e.g., if a Repair Station has an ASAP Program and discovers an error previously committed by an airline employee, how is this handled?
  - The FAA holds the trump card on individual ASAP submittals. Training and reasonableness of individual FAA Inspectors are in question.
8. What type of support do you need from your company management for effective implementation of ASAP agreements?
- Need more resources at the Company to investigate and administer the Program.
  - Human resources to conduct investigations.
  - Gained enough trust/faith in the company management that FAA does not have to take detailed notes. FAA has full support from their management
  - Need support up the entire management chain. At present, they are more concerned by actions taken by the more senior level management than the first level management. The further up the ladder, the more the info is skewed.
- It is of the utmost importance that we obtain acceptance of the ASAP philosophy from management. Their greatest concern is the protection of internal information.
  - There needs to be a follow-up and communication of recommendations and findings.
  - Mainly infrastructure support and administrative help, also training
  - FAA needs a better training program for their inspectors. Currently, most of the information presented is available via the Internet. The FAA instructors could not answer any maintenance-specific questions.
9. What type of support do you need from your labor union for effective implementation of ASAP agreements?
- Need Maintenance Union leadership to understand what ASAP is all about. ALPA is very well structured to disseminate information. Education is less effective in maintenance.
  - Assurances that management will support the Program and that protection from punitive action will be provided.
  - The labor leadership needs to know what ASAP is. Good organization of ALPA is a plus for them, not so for other unions.
10. Do you see any alternatives to ASAP agreements that may work better?
- Voluntary disclosure programs may work if managed/handled appropriately
  - We need a program developed by mechanics for mechanic. A new ASAP A.C. needs to be created for maintenance, not just patching up the existing A.C. that was originally created for flight personnel.
  - The ASAP A.C. does not cover non-certificated employees.
  - Company-specific internal error management program
  - There's no other certificate protection program
  - Best program, needs a bit of tweaking. I would never have submitted reports without this program.

#### Discussion

Of the several issues that were raised through the focus group discussions conducted for this study, it is important to note that interpersonal trust among mechanics, managers, and FAA inspectors play a key role. Also, the overall labor-management relationship

tends to “flavor” all collaborative programs; ASAP is no exception.

The discussions regarding differences between flight and maintenance ASAP programs were particularly lively because they brought out some fundamental differences in the work environments of the two professional groups. The flight environment is linear; whereas the maintenance environment is networked: in flight, there is a clear start and finish point and there are very limited number of people interacting with the flight for a short duration. In maintenance, a large number of people interact with the aircraft over a geographically and temporally distributed space. Consequently, error identification, reporting, and responsibility issues are extremely complicated as well as complex—complicated because these can be technically challenging issues and complex because multiple parties are involved in generation as well as resolution of problems.

#### Conclusion

The results presented in this study provide a qualitative understanding of the multitude of issues that influence the success of ASAP programs in maintenance organizations. In order to get a quantitative perspective on these issues and to understand the relative level of importance among these issues, a nationwide survey based on the results of this study is necessary.

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